

Some Features of Application of the Characteristic Transformations to Study Experimental Dependencies

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One of the main tasks of processing of research data is to diminish the number of experimental data that could characterize a system. To characterize processes going in a system under some influence and consequently to characterize the system itself it is convenient to use information connected with values of the characteristic functions / 1 / of relevant quantities of the system in flat sections of dependencies of these functions on a relevant parameter.

There are two main scheme of applying of the characteristic transformations to research functional features of studied dependencies / 2 /. We can apply, for example, only a few of the most preferable characteristic transformations to different functions of quantities that could describe processes in a studied system under influence. On the other hand, we can use different characteristic transformations for a few of the most preferable quantities. The first scheme allows us in all cases to use the simpler characteristic transformations with preferable dimensions of the characteristic functions like dimensionless index of susceptibility of studied quantities to changes of influence conditions or inverse characteristic time of changes of studied quantities during functioning and so on.

Here, we present the results on the first scheme of characteristic transformation application. The polarization H of the lithium battery, its inner resistance r , the discharge current I through the battery, the unused portion of the battery power HI and other quantities $(H)^a (I)^b$ were among the researched quantities. The experimental data have been obtained by the intensive research method / 3 /. The VARTA CR 2032, CR 2016 GP, ENERGIZER CR 2025, BR 2020, and BR 2325 lithium batteries were used at the study.

Some of the results of the research are presented in Fig. 1 – 2. They demonstrate visually possibilities of the discussed scheme of method application. They also show that during an influence, the time in which processes in the studied systems begin weakly depending on differences of pre-influence conditions (caused by previous more weak influences) can be essentially different for different strength of the previous influences. From all of the studied diagrams of the characteristic indexes researched by now, the diagrams of the index of the unused portion of the battery power (Fig. 2) have the most convenient form to study processes going in the lithium batteries in the broad region of discharge currents. However, in the region of small discharge currents, values of the indexes of other quantities could be also useful.

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References

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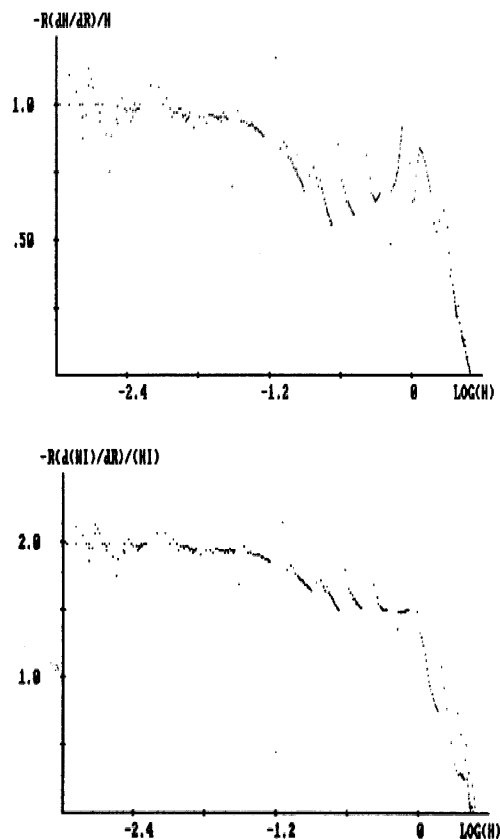


Fig. 1 – 2. The multidimensional diagrams of the characteristic indexes of susceptibility of the lithium battery polarization H and the unused portion of the battery power HI to changes of the outer load resistance R versus $\log(H)$.